Journal of Mechanical Design

Editorial

About a year ago the Engineering Design Program of the National Science Foundation sponsored a Workshop on Engineering Design in Year 2030. It brought together about 50 academic researchers and representatives from industry into four focus groups that considered the theoretical foundations, computing and information technology, social aspects, and innovation in engineering design. The participants reflected on research over the past 25 years and projected needs in the year 2030 to identify today's research priorities in engineering design.

The report recommends: (i) a commitment to research into the science of engineering innovation, (ii) a commitment to research into the socio-technical aspects of engineering design, and (iii) a high priority for research to develop computing and information and infrastructure. Of interest to me was a note that some of these ideas are to be found in a recent National Academy of Engineering (NAE) report, *THE ENGINEER OF 2020: VISIONS OF ENGINEERING IN THE NEW CENTURY*.

The NAE reports on its study of engineering education imagining technology needs in the year 2020. Counting backward from this future, an engineer who is to be 34 in 2020 has just entered college this past Fall 2004. With four years of college and 12 years of experience, today's freshmen will be excellent prospects for, if not already part of, engineering management.

Like our colleagues in the NSF Workshop, the NAE report considers the socio-technical aspects of engineering to be experienced by engineering managers of the future, and describes the characteristics of success:

> ''Effective and wise management of technological resources is integral to engineering work. The choices will be gray in nature, balancing (for example) economic, social, environmental, and military factors. Leaders, and those who influence these choices, will benefit from a sense of purpose and clarity. Successful engineers in 2020 will, as they always have, recognize the broader contexts that are intertwined in technology and its application in society. (pg. 56).''

Provoked to thinking as the NAE intends, I wonder how do I as an engineering educator ensure that our young student gains the ''sense of purpose and clarity'' necessary to guide choices that affect an employer or client relative to the broader contexts of technology and society?

This is not a new question to me. It arises in discussions of Canon 1 of ASME's, Code of Ethics, which states: ''Engineers shall hold paramount the safety, health, and welfare of the public in the performance of their professional duties.'' I interpret this to our young engineers as a requirement that they mitigate all risks of damage and injury that exceed acceptable levels, which, of course, leads to a discussion of the choice of acceptable risk levels.

It is here that the NAE document seems to advise our young colleague to be among those who ''influence these choices'' in response to an understanding of the ''broader contexts.'' The report ends by saying our Engineer 2020 will aspire to ''the ingenuity of Lillian Gilbreth, the problem-solving capabilities of Gordon Moore, the scientific insight of Albert Einstein, the creativity of Pablo Picasso, the determination of the Wright brothers, the leadership abilities of Bill Gates, the conscience of Eleanor Roosevelt, [and] the vision of Martin Luther King.''

The energy of the NAE vision and even that of our colleagues at the NSF Workshop on Engineering Design demands an active social role for the engineer of the future. Which brings us back to the question of how does today's engineering education and research provide the foundation necessary to address technological and social challenges of 2020 and 2030. This is not a new question, but it remains an important one. I look forward to more from the National Academy of Engineering and the National Science Foundation on this subject.

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